CSPA - Benchmarking and comparing performance of different Message Queueing Services

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Systems Under Test:

1. Kafka
2. RabbitMQ
3. ZeroMQ

System Test Modes – Parameters and Factors:

1. On Device – Centralized usage scenario

Analysis suite and system are live on the same system. This will validate performance for centralized, self-communicating applications

System Parameters

1. System specifications - Processor, Multithreading capability, RAM availability

System Factors

1. Size of message going into queue
2. Time interval between messages
3. Type of message stream - Iterative Single, Iterative Concurrent, Batch Single, Batch Concurrent
4. Variability of Concurrent Message Streams (# of concurrent devices sending to MQ)
5. RabbitMQ - Additional Feature - Persistence - applied on all above factors

2. Over Local Network – On-premises / internal application scenario

System is live on a machine which other machines interact with over the same local area network. This will validate performance metrics within a company premises for message queue usage in internal applications.

System Parameters

1. System specifications - Processor, Multithreading capability, RAM availability.
2. Performance of local area network, switching and routing devices used.

System Factors

1. Size of message going into queue
2. Time interval between messages
3. Type of message stream - Iterative Single, Iterative Concurrent, Batch Single, Batch Concurrent
4. Variability of Concurrent Message Streams (# of concurrent devices sending to MQ)
5. Number of devices present on local area network
6. Number of devices on local area network communication with queue service
7. RabbitMQ – Additional Feature – Persistence – applied on all above factors

3. Over Live Network – User scenario – MQ on remote machine

The message queueing system is live on a remote machine possibly managed by a third party vendor. This will validate performance metrics in a live application scenario, either through client requests, or internal application requests being queued in an external machine.

System Parameters

1. System specifications - Processor, Multithreading capability, RAM availability.
2. Performance of live network, switching and routing devices used, Internet service provider and DNS lookup services.

System Factors

1. Size of message going into queue
2. Time interval between messages
3. Type of message stream - Iterative Single, Iterative Concurrent, Batch Single, Batch Concurrent
4. Variability of Concurrent Message Streams (# of concurrent devices sending to MQ)
5. MQ server hosting location and performance of services offered by vendor

Description of Workload, Metric and Evaluation Technique Selection:

Workloads

Single Message Stream mode:

1. Iterative Single workloads, Fixed Length: Messages of the same size, sent to queue one at a time continuously
2. Iterative Single workloads, Variable Length: Messages of random length, sent to queue one at a time continuously
3. Concurrent Single workloads, Fixed Length: Messages of the same size, sent to queue from multiple devices one message at a time
4. Concurrent Single workloads, Variable Length, Messages of random length, sent to queue from multiple devices one message at a time

Batch Message Stream mode:

1. Batch Single workloads, Fixed Length: Messages of the same size, sent to queue in random batch sizes
2. Batch Single workloads, Variable Length: Messages of random length, sent to queue in random batch sizes
3. Concurrent Batch workloads, Fixed Length: Messages of the same size, sent to queue from multiple devices in random batch sizes
4. Concurrent Batch workloads, Variable Length, Messages of random length, sent to queue from multiple devices in random batch sizes

Metrics

1. Latency - time between sending of message until message is registered in queue - for each message in Single Message Stream mode, per batch in Batch Message Stream Mode
2. Throughput - For Single Message Stream mode - Concurrent, Batch Message Stream mode - concurrent

Evaluation Technique

A benchmark program will be written, containing programs for each workload type, beyond which measurement using software monitors will be employed.
Therefore, Simulation and Measurement

Analysis Techniques and Visualization:

The results will be put through statistical analysis and visualized. Regression lines will be fit to extrapolate performance given a scenario.

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